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THE SCIENCE PRESS

**100 Liberty St., Utica, N. Y. Garrison, N. Y.**

**New York City: Grand Central Terminal**

**Annual Subscription, $6.00 Single Copies, 15 Cts.**

**Entered as second-class matter January 21, 1922, at the Post Office at Utica, N. Y., Under the Act of March 3, 1879.**

## INVESTIGATIONS ON THE BACTERIOLOGY OF EPIDEMIC INFLUENZA[1]

EPIDEMIC influenza has been recognized for centuries, now under one designation, now under another. According to the exigencies of the period it has had a wide or a more restricted distribution: in early times human transport carried the pestilence slowly and over limited areas; in modern times, in a world knit closely together with frequent and rapid transport, it passes quickly from continent to continent.

The source of origin of the epidemics is still under discussion, and it remains for future study to determine whether the spread takes place from a single focus or from many foci of epidemicity. History traces the outbreaks of many epidemics to regions of Eastern Russia and Turkestan; but indications are not wanting that influenza smoldered in many endemic centers preceding the pandemic of 1918. Whichever of these divergent sources of origin proves to be the true one, certain undiscovered but essential conditions must be regarded as combining to convert endemic inactivity into epidemic spread.[2, 3]

### THE EPIDEMIC OF 1918

The epidemic outburst of 1918, which was of unparalleled severity, coincided with the exigencies of the Great War so that the full weight and force of modern methods of clinical and bacteriological study could not quickly be brought to bear upon the disease. In many instances also investigators were further handicapped through failure to distinguish the primary infection from the frequent secondary pneumonias of common bacterial origin, or were prejudiced in their views by the general acceptance of Pfeiffer's bacillus as the bacterial incitant of influenza.

[1] From the Laboratories of the Rockefeller Institute for Medical Research, New York, N. Y.

[2] Pearl, R., *U. S. P. H. S. Report* No. 548, 1919, xxxiv, 1744.

[3] Flexner, S., SCIENCE, l, 317.

Early in the course of the epidemic, discordant findings cast doubt on the part played by Pfeiffer's bacillus as the incitant of the disease. The doubt arose through the failure of certain competent investigators to find Pfeiffer's bacillus regularly in the blood or nasopharyngeal secretions of early cases, although, like other ordinary bacteria it was frequently found in the pneumonias that supervened on the primary infection. This organism was also reported as a secondary invader in other diseases, such as measles, whooping cough and tuberculosis, and occurred as often in normal throats as in the presence of respiratory infection. Antibodies against Pfeiffer's bacillus were not found, or could be demonstrated only with puzzling irregularity in the blood of recovered influenza patients, and serological variations among the pathogenic strains were so great that no single type could be identified as common to the majority of cases, although the rapid spread and common character of the epidemic would postulate a single incitant. Finally, vaccines containing Pfeiffer's bacillus and other ordinary bacteria cannot be said materially to have affected the incidence of influenza among those vaccinated. Apparently a certain protection against the secondary pneumonias could be effected by their use.[4]

Similarly, studies of other common bacteria (such as *Micrococcus catarrhalis*, or organisms of the streptococcus or pneumococcus groups) frequently found in the nasopharyngeal secretions or pathological exudates of influenza victims, failed to discover the primary infectious agent in the epidemic disease.

### DEFINITION OF EPIDEMIC INFLUENZA

The other factor contributing to the confusion that existed during the early period of the epidemic was a frequent failure to recognize influenza as a specific primary disease, and to relegate the various bacterial pneumonias that developed in influenza-injured lungs to the rôle of secondary infections. Unless this distinction was clearly recognized, and the influenzal incitant sought only in the early hours of the disease, before it was masked and perhaps completely supplanted by associated organisms, little hope could be entertained of its recovery.

It is therefore important to define epidemic influenza in its early stages, before secondary infections obscure its specific characters. Our investigations were based on the uncomplicated disease within 36 hours after onset. Uncomplicated epidemic influenza is usually a mild affection. On the fringes of an epidemic it is not always easy to make an assured diagnosis from other indefinite ailments of the upper respiratory tract. In the midst of an epidemic, however, when many similar cases may be seen, its manifestations are more obvious and uniform. The onset is usually sudden with a chill, or chilly sensations, and fever. Headache, frontal or general, develops, with pains in the back, joints and extremities. In the severer cases the prostration that accompanies these symptoms forces the patient to bed. The eyes become inflamed and sensitive to light. The face is suffused; the throat edematous and raw, a thin irritating secretion flows from the nose, and the progress of the infection is denoted by hoarseness and a dry and distressing bronchial cough. Examination of the chest, however, reveals no certain signs of lung involvement. Other organs are not usually obviously affected. Pulse and respiration are only slightly accelerated. The temperature remains fairly constant, between 101.5 to 103° F. for two to four days and then, after a profuse perspiration, it falls rapidly to normal with the onset of convalescence.

A peculiar feature of the disease is an early drop in the circulating white blood cells to less than 5,000 cells per cubic millimeter. This diminution may persist through the acute stages of influenza and into convalescence. The mononuclear cells are particularly affected, but convalescence may witness a compensatory rise above the normal.

The duration of uncomplicated influenza is usually one to three days; in the severer cases four to six days. When symptoms persist beyond this period a secondary pneumonia or some other sequel is to be suspected.

Variants of the typical disease have been observed, with signs and symptoms referable to the gastro-intestinal tract, the nervous system and the heart. Mild and abortive cases

[4] Park, W. H., *Jour. Immun.*, 1921, vi, 103; McCoy, G. W., *Jour. Amer. Med. Assn.*, 1919, lxxiii, 401.

also occur—cases that may be missed but that probably are capable of spreading the infection. These patients may experience the typical syndrome and show the characteristic changes in the blood picture, but are not so severely stricken as to be driven from their daily tasks. The presence of the influenzal injury is indicated, nevertheless, in an incidence of complications out of proportion to the apparent innocence of the primary ailment.

The striking features of an epidemic, the features that give influenza its evil reputation, are the rapid spread, coupled with a high incidence of infection; so that more than half a population may be attacked in the first wave; the frequent occurrence of severe and fatal secondary pulmonary infections to which influenza makes its victims liable; and the recurrence of successive waves of diminishing extent and severity until, in the course of three or four years, the epidemic dies out.

### EXPERIMENTAL INOCULATIONS

In September, 1918, when it was decided to undertake an etiological investigation of epidemic influenza in the laboratories of the Rockefeller Institute it was thought fruitless to attack the problem by the common cultural methods of bacteriology. Animal transmission experiments were considered first with a view to initiating an experimental infection of an influenzal character. Among the characteristic signs of the human infection, the typical changes in the blood picture seemed to promise a measurable diagnostic criterion. It also appeared probable that some pathological basis might be found for the striking defect in resistance to secondary infections which so often opened the way to pneumonias of bacterial origin.

The first experiments were undertaken with the unfiltered nasopharyngeal secretions of patients with uncomplicated epidemic influenza, as diagnosed from the train of symptoms and signs narrated above. These nasopharyngeal secretions, obtained by a saline lavage of the nose and throat, of course contained an extensive bacterial flora. It was expected, however, that in favorable instances ordinary bacteria might be suppressed by animal passage and that the specific effects of an extraordinary microorganism might thereby be revealed.

In a short series of experiments, monkeys (*Macacus rhesus*) were found to be unsuitable, because of their scarcity and the frequent presence of pulmonary infections (especially tuberculosis) in the stock. These preliminary experiments served, however, to orient us in methods of inoculation. Injections of influenzal nasopharyngeal secretions into the nose and throat, the conjunctivæ, the circulation and under the skin produced no distinctive effects. On the other hand, when the injections were made intratracheally into the lungs, the animals showed a subsequent decrease in the white cells of the blood, a change affecting chiefly the mononuclear cells. But this suggestive sign could not be correlated with local lesions in the lungs because of the frequence of pathological conditions due to other causes. Our results were essentially different from those obtained by Bradford, Bashford and Wilson[5] who obtained broncho-pneumonia and nephritis under similar experimental conditions. Nor could we cultivate from the monkey's lungs or from the nasopharyngeal material the "globoid bodies" described by them or by Gibson, Bowman and Connor.[6] The rabbit was then chosen as the experimental animal.

Inoculations through the trachea into the lungs of normal adult rabbits of the nasopharyngeal washings of patients in the early hours of influenza were found to be followed by characteristic effects. On the first or second day after injection the rabbits appeared ill, with ruffled fur, conjunctivitis, and, usually, a degree or two of fever. The constant feature was a definite and often striking numerical depression of the circulating white blood corpuscles, affecting chiefly the mononuclear cells, which often fell below 2,000 and sometimes below 1,000 per cubic millimeter. In the natural course of events these signs endured for two or three days and the animal then returned to normal. If the rabbit was killed at the height of the attack—for in the absence of secondary infection by ordinary bacteria none died—an unusual pathological picture was discovered in the lungs. The respiratory organs alone were visibly affected. The lungs were distended by

[5] Bradford, J. R., Bashford, G. P., and Wilson, J. A., *Quart. Jour. Med.*, 1918, xii, 259.

[6] Gibson, H. G., Bowman, F. B., and Connor, J. I., *Brit. Med. Jour.*, March 22, 1919, 331.

an exudation of fluid (edema) into the interalveolar walls and by a large emphysematous space due to their rupture. On surface view and on cut section they were mottled with numerous large and small hemorrhages in the substance of the lung. Macroscopically, besides the edema, ruptures and hemorrhages, a scanty cellular exudate of mononuclear and, to a less extent, of polynuclear cells was found. The bronchii and bronchioles also were often filled with serous fluid and showed necrosis and exfoliation of their epithelium. Thus, while the lung structure was severely injured and disorganized in certain areas, there was a complete absence of the fibrinous and cellular consolidation of the lungs which characterizes pneumonias of ordinary bacterial origin. In many instances no ordinary bacteria could be recovered from the lesions either in stained impression films or by erobic or anerobic methods of cultivation. We concluded that the clinical and pathological effects induced by the intratracheal injection of the influenzal washings were independent of the presence of commonly recognized microorganisms.

By the intratracheal injection of a saline suspension of ground lung tissue from a previously affected rabbit, the typical syndrome just described could be induced successively in a series of animals. In one instance 15 successive passages were obtained before the experiment was discontinued. Because of the persistence of these characteristic effects, in spite of the repeated dilution of the original material between passages, we were led to believe that we were dealing with a self-perpetuating agent; a living virus or microorganism.

It was soon found that the elements of this virus were of such minute proportions that they readily passed through earthenware filters impervious to ordinary bacteria. In this way it could be separated from other microorganisms in the nasopharyngeal secretions or in affected rabbits' lungs. The filtered material produced the typical train of clinical and pathological effects in rabbits and so proved that ordinary bacteria were not involved in the process. The microorganism was a filter-passer.

Now although very few filter-passing microorganisms have been identified, the group, in general, has certain well-known characters which this virus was found to share. For example, although it was readily killed by heat at 56° C., it was resistant to drying or freezing, and could withstand the action of 50 per cent. glycerol for periods up to nine months. When animal tissues containing it were contaminated by molds or bacteria the virus still survived.

Another noteworthy effect of this active agent early claimed our attention. When unfiltered nasopharyngeal secretions from influenza patients were intratracheally injected in rabbits, other microbic residents of the upper respiratory tract were likewise deposited in the animal's lungs. Ordinarily such bacteria do not produce lesions under these conditions, but are overpowered by the active protective mechanisms of the body. But in the presence of the primary injury caused by the influenzal agent these bacteria were sometimes able to multiply and cause severe pneumonias. We have already referred to the frequency of such a train of events in human cases, and the similarity of these accidental infections in the experimental animals led to a series of experiments to put this significant sequence of events to further test.

Thus it was found that a decrease in pulmonary resistance to such common bacteria as the pneumococcus, streptococcus, and *Bacillus pfeifferi* was a characteristic result of infection with the filterable virus. In some experiments, after the lungs had been damaged by the influenzal agent, the other organisms were injected into the trachea, since this is the route they are supposed to follow in man. In other experiments, as a severer test, small doses were injected into the circulating blood. Uniformly the common bacteria invaded the injured lungs and there induced a typical pneumonia. To the normal lungs of control animals the same doses of these microorganisms were harmless.

One more effect of the influenzal agent may be mentioned here before passing on to its identification. Rabbits allowed to recover from a primary infection with the virus were found to be immune to a subsequent inoculation.

In all, thirteen specimens of the active agent were recovered from the nasopharyngeal secretions of influenza patients in the first 36 hours of the disease. Five strains were obtained in 1918-1919, two during the recurrence of 1920 and six in 1922. During the same

periods, three similar transmission experiments failed. On the other hand the active agent was not obtained from 12 influenza patients, the onset of whose illness had occurred more than 36 hours previously, nor from 17 persons free from influenza during the epidemic and inter-epidemic periods.

### ARTIFICIAL CULTIVATION

In the beginning of this investigation, while the first animal transmission experiments were in progress, attempts were made to isolate the active agent in artificial cultures. For this purpose ordinary methods of cultivation were discarded in favor of the particular methods which Dr. Noguchi had developed in the course of his successful cultivation experiments with various highly parasitic treponemata, and with the filterable "globoid bodies" of poliomyelitis. These methods, in turn, were based on the earlier experiments of Dr. Theobald Smith. The Smith-Noguchi culture medium consists of sterile ascitic fluid or diluted serum, to which is added a small fragment of fresh, sterile, tissue —usually rabbit kidney. The peculiar attributes of the tissue fragment are not completely understood, but it seems to combine special nutritive or growth-promoting properties with a reducing activity which establishes anerobic conditions in the depth of the tube. The choice of this medium for the cultivation of the active agent of the transmission experiments proved to be a fortunate one.

In November, 1918, certain extremely minute but characteristic bodies were observed in strictly anerobic cultures of the filtered nasopharyngeal secretions of an influenza patient in the early hours of the disease. They approached the globoid bodies of poliomyelitis in size, but were somewhat longer in one axis than in the other. They stained with difficulty with the usual basic dyes and decolorized by Gram's method. That was about all that the sparse growths of the initial cultures revealed. Soon, however, other cultures were obtained, both from the filtered nasopharyngeal secretions of other influenza patients and from the whole or filtered lung tissue suspensions of rabbits which had been typically affected by these secretions, as has been described. As these minute microorganisms were carried through successive generations of culture, they became better adapted to artificial cultivation and multiplied more luxuriantly, so that the cultures could be used in animal experiments with unequivocal results. These experiments proved beyond question the identity of the active agent obtained from influenza cases and the bodies obtained in culture. Both were derived from the same sources. Both were filterable. Both produced identical clinical and pathological effects in rabbits, and from the pulmonary lesions produced by either, further animal passages, or cultures, could be obtained. Both, protected by bits of affected lung tissues, withstood 50 per cent. glycerol for periods of months. Both had that curious property of damaging the lung in such a way as to lower its resistance to secondary invasion with ordinary bacteria. It was from this character that the microorganism, objectively, received its name. We called it *Bacterium pneumosintes*—a bacterium that injures the lung. Finally, conclusive evidence of the identity of the virus and *Bacterium pneumosintes* was furnished by a series of experiments which showed that a previous infection with either one of these pathogenic agents rendered an animal immune to attack by the other.

### IMMUNITY

In many infectious diseases, the immunity conferred by an attack is associated with the appearance in the blood of specific principles, or antibodies, which can be demonstrated by serological tests. Our efforts were therefore directed toward the observation of antibodies in the blood of experimentally infected rabbits, and of influenza patients, from which the strains of *Bacterium pneumosintes* ultimately had been derived. But it was found that cultures of *Bacterium pneumosintes* in the Smith-Noguchi medium were unsuitable for serological experiments. The sparse growth of the earlier generations was mixed with protein precipitate that interfered with agglutination and precipitation reactions and had antigenic properties that precluded its use. It was therefore necessary to devise special methods of cultivation, and before these methods were available the first opportunity was lost to test for antibodies in the blood of influenza patients and of affected rabbits.

We found later that if the Smith-Noguchi medium was enclosed in a collodion sac, sur-

rounded by distilled water or physiological salt solution, anerobic conditions were shortly established throughout the system and the nutritive and growth-promoting substance of the medium diffused through the membrane in sufficient quantities to support a luxuriant growth in the surrounding liquid. The protein-precipitate that collected around the tissue fragment was retained within the sac.

When it was possible to cultivate *Bacterium pneumosintes* by this method in quantities sufficient for use, rabbits were repeatedly injected intravenously with small doses of live cultures, or of heat-killed organisms. After a suitable interval, their blood serum was found to possess specific antibodies against *Bacterium pneumosintes* which could be demonstrated by agglutination, precipitation, complement fixation and phagocytic tests. A significant feature of the immunological experiments and also of these serological tests was the fact that all the strains tested had similar antigenic properties and reacted identically with the specific antibodies produced by any one of them. This is what would be expected if they were all derived from a common source.

The development of immunity in experimental animals as a result of previous infection, and the appearance of serum antibodies after intravenous inoculation of living or killed cultures led us to infer that the mechanism of protection against *Bacterium pneumosintes* does not differ from that which comes into play in the case of infections with erobic pathogenic bacteria. Two important deductions, both susceptible of experimental proof, may be drawn from this conclusion.

One has already been mentioned—that the immunity conferred by an attack might be associated with the appearance of specific protective principles in the blood. The other is that these specific antibodies might be developed as a result of prophylactic subcutaneous injections of heat-killed organisms.

But in the absence of recent cases of influenza, or of fresh, pathogenic strains of *Bacterium pneumosintes*—(for the strains obtained in 1918-1919 and 1920 had become saprophytic from long cultivation) we were for some time unable to test these hypotheses. The opportunity was finally afforded by a recurrence of epidemic influenza in New York City in January and February, 1922.

With material obtained from a number of early cases of influenza in this outbreak we repeated all of the essential steps of the former investigation, so that this series of experiments served to check and confirm the results of the earlier work. In brief, from the nasopharyngeal washings of eight patients in the early hours of uncomplicated influenza, the pathogenic agent was transmitted to animals in six instances. One of the two failures may possibly be attributed to the fact that the nasopharyngeal secretions stood for 24 hours at room temperature before injection. From these animals or their successors, three new strains of *Bacterium pneumosintes* were isolated, and a fourth strain was recovered by direct cultivation from a ninth patient whose filtered secretions were not injected into rabbits.

Since the clinical and pathological effects produced in rabbits by the new strains of the active agent appeared to us to be identical with those observed during the former epidemic waves, it is not necessary to describe them again in detail. The new strains of *Bacterium pneumosintes,* when isolated in artificial cultures, also had properties identical with those of the old strains obtained in 1918-1919 and 1920.

For example, they had the same morphology and cultural characters. They were filterable. They resisted the action of 50 per cent. glycerol. They were typically pathogenic for rabbits and reduced the resistance of the pulmonary tissues to secondary invasion with common bacteria. The new strains were specifically agglutinated by immune serum made with the old strains, and *vice versa.* Rabbits immunized by intratracheal injection of the old strains were subsequently resistant to the new.

In the earlier transmission experiments *Bacterium pneumosintes* had not been identified with certainty in microscopic sections of affected rabbits' lungs, but during these recent studies, by special methods of staining, we demonstrated the presence of minute bodies, morphologically identical with *Bacterium pneumosintes,* in the pulmonary lesions of six rabbits injected with

the active agent from 1922 cases of influenza. From three of these animals pure cultures of the organism were subsequently obtained.

With the 1922 strains of *Bacterium pneumosintes* we were now able to carry out the tests for specific antibodies in the blood of recovered influenza patients, and also the study of prophylactic vaccination which had long been postponed. In the first experiments specimens of serum from 19 persons who had recovered from influenza from 10 days to five months previously and from 22 other persons who gave no history of influenza since 1920 were studied in agglutination tests. The method used was one recently developed in the laboratory of the Rockefeller Institute, by Dr. Northrop and Dr. De Kruif[7] that increases the sensitiveness of the reaction without impairing its specificity. In the control tests no agglutinins or precipitins were found in the serum of 22 persons who had never had influenza or had not been recently attacked. We concluded that the blood of normal persons does not contain demonstrable antibodies against *Bacterium pneumosintes*. On the other hand, the serum specimens from 17 of 19 persons who had influenza during the recurrence of 1922 specifically agglutinated both old (1919) and new (1922) strains of *Bacterium pneumosintes*, and in 12 of 15 sera tested precipitins were also discovered.

One of the persons chosen as a control subsequently had clinical influenza. It was interesting to find that his blood serum, previously negative, contained agglutinins for *Bacterium pneumosintes* when tested on the tenth and eighty-ninth days after recovery. In other instances demonstrable agglutinins persisted in the blood for at least five months following an attack of influenza.

The second series of experiments that were made possible by the acquisition of new and pathogenic strains of *Bacterium pneumosintes* dealt with the immunizing effects in rabbits of subcutaneous injections of appropriate doses of the heat-killed organisms. When a number of rabbits had been prepared by three injections of the killed bacteria the protective effects of the vaccination were demonstrated in two ways. By serological examination it was found that 11 among 15 vaccinated animals had developed specific agglutinins against *Bacterium pneumosintes*. Their resistance was then tested to doses of the living organisms which were pathogenic for normal, unvaccinated animals. In all but two instances the protection was complete. Not only did the vaccinated rabbits fail to show the characteristic signs of infection with *Bacterium pneumosintes* but, with the two exceptions noted above, they were normally resistant to secondary infection with a pneumococcus, a streptococcus, or *Bacillus pfeifferi*. Incidentally, it was observed that the doses of vaccine were well borne and did not even temporarily reduce the rabbits' resistance to other infections. These experiments therefore pointed the way to a similar series of observations in man.

At the invitation of Lieutenant Colonel Charles F. Craig, a number of officers and enlisted men at the Army Medical School in Washington, D. C., volunteered to submit to vaccination with *Bacterium pneumosintes*. They were accordingly given three subcutaneous injections of killed culture in a manner similar to that employed with antityphoid vaccine. The doses chosen did not cause any severe local or general reactions, the subjective effects being somewhat milder than those experienced after antityphoid vaccination. But on the tenth or eleventh day after the final injection the blood serum of seven among nine men examined contained specific agglutinins for *Bacterium pneumosintes*, thus indicating the formation of protective antibodies as a result of the injection of vaccine.

On the basis of these observations the vaccine is being offered to much larger groups of men in the United States Army. It is not possible, of course, to determine the protective effects of these injections directly. In the event of a recurrence of epidemic influenza in the near future, however, the efficacy of vaccination with *Bacterium pneumosintes* as a preventive measure may be put to test. Meanwhile methods are at hand for the production of large amounts of vaccine if its widespread use should be indicated.

Before summarizing briefly the results of these experimental studies of the nasopharyngeal secretions of influenza patients mention may be made of the fact that *Bacterium pneumosintes* is not the only anerobic, filter-passing, Gram-negative microorganism to be found in the human respiratory tract. From the naso-

[7] Northrop, J. H., and De Kruif, P. H., *Jour. Gen. Physiol.*, 1922, iv, 639, 655.

pharyngeal secretions of one influenza patient, and of a considerable number of other persons, normal or suffering from various mild respiratory infections, other filterable organisms, not *Bacterium pneumosintes* and not pathogenic for rabbits, have recently been cultivated. What the importance of these microorganisms may be, or whether they have any pathogenic significance, remains to be determined. They indicate, however, that the cultural methods recently employed in these studies may lead to the isolation of a group or groups of hitherto undescribed bacterial inhabitants of the upper respiratory tract and so they point to interesting opportunities in this field of bacteriology.

CONCLUSIONS

In conclusion, we have isolated from the nasopharyngeal secretions of influenza patients in the early hours of the epidemic disease a hitherto undiscovered organism, *Bacterium pneumosintes,* filterable, anerobic, resistant and pathogenic for rabbits, in which it induces a typical infection comparable with epidemic influenza in man. The significant features of this experimental infection are the incidence of a leucocytic depression chiefly affecting the mononuclear cells, and the production of a characteristic lesion in the lungs associated with a defect in their resistance to secondary invasion with common pathogenic bacteria.

All our strains of *Bacterium pneumosintes* have similar antigenic properties, indicating a common source. Animals subjected to a primary infection, or injected with living or killed organisms are immune to subsequent injection. The killed bacteria induce specific antibody formation even when injected subcutaneously in doses well tolerated by man. The blood serum of recovered influenza patients contains agglutinins for *Bacterium pneumosintes,* whereas that of normal persons does not.

On the basis of these experimental observations, reported in detail in *The Journal of Experimental Medicine,*[8] and especially in view of the source of the cultures, their clinical and pathological effects in rabbits, their antigenic identity, and the presence of specific agglutinins in the blood serum of recently recovered influenza patients, it might seem justifiable to claim *Bacterium pneumosintes* to be the bacterial incitant of epidemic influenza. At present, as already stated in an earlier report, such a course does not seem desirable. Apparently we are at the threshold of knowledge of a group or class of minute microorganisms which the anerobic Smith-Noguchi technique and more recently developed methods of cultivation have thrown open to exploitation. It has seemed wiser, therefore, merely to report the experimental facts, and to defer decision of the precise relation which *Bacterium pneumosintes* bears to epidemic influenza until further experience is obtained.

PETER K. OLITSKY
FREDERICK L. GATES

THE ROCKEFELLER INSTITUTE
FOR MEDICAL RESEARCH

[8] Olitsky, P. K., and Gates, F. L., *Jour. Exper. Med.,* 1921, xxxiii, 125, 361, 373 and 713; *ibid.,* 1921, xxxiv, 1; *ibid.,* 1922, xxxv, 1, 553 and 813; *ibid.,* 1922, xxxvi, 685. Papers XI and XII in press.

## GARDEN FOR THE PROPAGATION OF TROPICAL AND SUBTROPICAL PLANTS

UNDER a revocable license, which it is believed insures a sufficiently long tenure to secure useful results, Secretary Weeks has just turned over to Secretary Wallace the Chapman Field air station of 850 acres, located on Biscayne Bay, 12 miles south of Miami, Florida. This tract has a coast line of 1⅖ miles and is composed of about 195 acres of pine land and rock reef and 655 acres of low land and mangroves, more or less subject to overflow during the high waters. Of this latter, 80 acres have been filled above high water level and will be made available for use as soon as the salt has been washed out of it.

The striking feature of this tract of land is that it is located in one of the warmest spots on the whole peninsula of Florida, which means that it is less liable to cool winter temperatures than almost any other spot in continental United States. Vegetation which is strictly tropical, such as that of the mango, coconut palm, and West Indian avocado can be grown here in perfect safety. It is not commonly understood that in such a station can be propagated to advantage a wide range of those valuable food and otherwise useful plants upon

which the development of the horticulture of the tropics is dependent.

The insect pests and fungus diseases which make plant propagating difficult and the distribution of small nursery plants so dangerous in the tropics can be kept under control on this coast of Florida, and this control represents an advantage of no mean importance in the dissemination of tropical plants.

Not only this. The growth of Florida has thrown into a region in which the white man can work out of doors hundreds of thousands of intelligent horticulturists who are keenly interested in the development of those fruits, vegetables, forage crops and grains which can be grown somewhere on the 54,000 square miles of Florida territory, a region which in area is only one fifth less than the whole of New England with its six and a half millions and more than half as large as the whole West Indies with their six millions of people.

The Department of Agriculture has maintained in Miami since 1898 a Plant Introduction Garden and research laboratory on Brickell Avenue, on seven acres of land the use of which was given the department by the late Henry M. Flagler and Mrs. Mary Brickell, and since 1914 a twenty-five acre garden at Buena Vista, on land given to it by Mr. Charles Deering, of Chicago.

With the great influx of settlers into south Florida, the growing interest of Americans in the tropics, and the increase in utilization of tropical plants by Americans in Panama, Hawaii, and Porto Rico, has come the evidence that much more comprehensive facilities must be arranged for to take care of the coming demand for useful tropical plants than has hitherto been realized.

The stringency of the regulations covering the importation of living plants from tropical countries has tended largely to increase the demand for government aid in their introduction and the first step in meeting this demand is the acquiring of a suitable site of adequate size for the operation of a plant introduction garden.

Through the action of Secretary Weeks, this first step in the origination of this new garden has been made possible.

The range of plants which will be grown and sent out from the new Chapman Field Garden will include many which are adapted to regions visited by severe frosts, for it has been found that under lath sheds a very wide range of young plants can be grown economically.

While the distribution of new experimental plants will always be a prominent feature of the new garden, a test orchard and arboretum will be gradually built up, in which will be preserved collections of the valuable and beautiful trees and shrubs of foreign countries which are adapted to the soil and climate of Chapman Field.

Inasmuch as it will require several years to build up such a garden, and, inasmuch as there are growing at the Brickell Avenue and Buena Vista gardens many rare and valuable specimen plants, these older gardens will be maintained for the present and probably for some time to come.

In how far this garden can fulfil the functions of an arboretum such as the Arnold Arboretum the circumstances of funds and soil conditions will determine. That it can be developed into a center of tropical agricultural research seems certain. Its position on the waters of the Caribbean, within thirty-six hours of the great centers of American civilization, cannot fail to make it in time the most available spot for American students to visit, who want to get an idea of the great problems of the tropics and live in a perfectly healthy climate in an intellectually stimulating community.

To the state institutions of Florida especially the collections of tropical plants must appeal particularly, for from the growing body of students of agriculture and horticulture of that state should come the men and women who will develop the new tropical vegetables, fruits, forage crops and ornamental plants which are destined to compose not only the agriculture of Florida but the agriculture of many strictly tropical regions as well. In time it should become a center where the strictly tropical plants will be bred with the hardier forms of the regions further north and result in combinations of characters hitherto unknown. Plant breeding has so far scarcely touched the tropics, and the opportunities presented by a garden at Chapman Field for the production of new and valuable forms are believed to be very unusual.

There is a special romance connected with this spot on the coast of Florida which ought to appeal to all agriculturists. Chapman Field, which is named in honor of Manuel Chapman, the first American aviator to fall in the great war, joins on the east the Perrine grant which was the first grant of any kind whatever made by the Congress of the United States in aid of agriculture. It was made July 7, 1838, to Dr. Henry Perrine who was killed by the Indians while he was making efforts to establish on his grant tropical trees and plants, particularly the sisal fiber plant from Yucatan, for which plant introduction purpose he had been granted a township of land in what was then the wilderness of south Florida.

As the work develops, the Chapman Field Garden will place its facilities at the disposal of the investigators in other offices of the Bureau of Plant Industry. Under proper departmental procedure, it will also cooperate with other research institutions throughout the country. Studies in the tropics or subtropics often shed a new light upon problems of northern agriculture and have a broadening influence of great value upon the mind of any investigator.

Much of the equipment remaining at Chapman Field, such as its water system, buildings, etc., can be utilized.

The management of this new garden will be in the office of Foreign Seed and Plant Introduction of the Bureau of Plant Industry.

DAVID FAIRCHILD
*Agricultural Explorer in Charge*
OFFICE OF FOREIGN SEED AND
PLANT INTRODUCTION,
JANUARY 12, 1923

## SCIENTIFIC EVENTS

### THE CARNEGIE CORPORATION

ACCORDING to the report of the president of the Carnegie Corporation made public on February 5, the major interests at present receiving their support wholly or largely from this corporation are the Institute of Economics in Washington, an agency for analyzing and publishing economic facts in popular form; the Food Research Institute at Leland Stanford University, a scientific extension of studies in the production and distribution of foods begun by Mr. Hoover during the war; the National Research Council in Washington, an organization that aims to focus and promote all sorts of scientific research in America; the Potter Metabolic Laboratory at Santa Barbara, California, where insulin, the recently discovered specific for diabetes, is being manufactured and perfected; the American School of Classical Studies at Athens, for which the corporation is paying the cost of a building to house a library recently acquired by the school; and comprehensive investigations into the fundamentals of unemployment and into the means of improvement of the law.

A total of $5,254,000 has been paid to beneficiaries during the year ended September 30, 1922, of which $2,578,000 went to colleges and universities. Of nearly $58,000,000 expended during the eleven years of the corporation's existence, $23,415,000 has been given to Carnegie institutions: the institution at Pittsburgh, the foundation in New York and the institution and the peace endowment in Washington. In addition to $30,000,000 granted by Mr. Carnegie personally for public library buildings, $12,292,000 has been devoted by the corporation to the same purpose. Schools and colleges have received $9,276,000; medical and health education, $3,266,000; and scientific research, $1,511,000, chiefly within the past four years.

The report explains the policy of the corporation in discontinuing its gifts of libraries, and in a discussion of the "science of giving," notes the difficulties of making wise public benefactions.

The assets of the corporation amount to $130,000,000, which will be increased by about $10,000,000 on the final settlement of Mr. Carnegie's estate. The board of trustees, which includes as *ex officio* members the heads of the six important Carnegie organizations, is to be enlarged from ten to fifteen members. As has already been noted, Dr. Frederick P. Keppel, formerly dean of Columbia College and this year in charge of work for the Russell Sage Foundation, has been elected president of the corporation.

### THE PROPOSED REORGANIZATION OF FEDERAL HEALTH ACTIVITIES

WE learn from a report in the *Journal* of the American Medical Association that, on

January 17, a conference was held in the office of Brigadier General C. E. Sawyer, physician to President Harding and chief coordinator of the federal Board of Hospitalization, to consider plans for the coordination of the health activities of the federal government. In addition to General Sawyer and the surgeon-generals of the army, the navy and the public health service, there were present Dr. A. W. Belting, president Eastern Homeopathic Medical Association, Trenton, N. J.; Lieutenant Commander J. T. Boone, Medical Corps, U. S. Navy; Dr. Claude A. Burrett, Rochester, N. Y.; Dr. Gilbert Fitzpatrick, chairman, executive committee, American Institute of Homeopathy, Chicago; Dr. C. W. Garrison, executive secretary and state health officer, State Board of Health, Little Rock, Ark.; Dr. James A. Hayne, secretary and state health officer, State Board of Health, Columbia, S. C.; Dr. A. T. McCormack, president, Conference of State and Provincial Health Authorities of North America, and secretary, State Board of Health, Louisville, Ky.; Dr. R. M. Olin, state health commissioner, Lansing, Mich.; Colonel W. O. Owen, Washington, D. C.; Dr. W. A. Pearson, dean, the Hahnemann Medical College and Hospital, Philadelphia; Dr. Ennion G. Williams, state health commissioner, Richmond, Va., and Dr. William C. Woodward, executive secretary, bureau of legal medicine and legislation, American Medical Association.

According to the plan submitted by General Sawyer, the proposed department will be known as the Department of Education, Health and Welfare, with a secretary who is to be a cabinet officer at its head, and an assistant secretary. The plan calls for the creation of a bureau of education, a bureau of health, a bureau of social service, and the Veterans' Bureau, each with a director-general at its head. It is to be expected, of course, that the secretary, and possibly the officer next in rank, the assistant secretary, will, because of their rank and their relation to the determination of the policies of the government, change with each administration. The several director-generals, however, are to be the technical heads of the bureaus, and as more or less permanent officers to preserve continuity of policy and administration. The plan calls for no enlargement or reduction in the activities of the several branches of the federal government now engaged in work in the lines of activities to be incorporated in the new department. It is proposed that the various agencies of the federal government (except those within the army and navy) relating to health, education, social service and the rehabilitation of veterans be transferred to the new executive department, each to carry with it its present powers, appropriations and personnel, intact. It was suggested that the prospect was never better than now for the establishment of medicine as a fixed unit, associated with other departments of the government, providing in a most satisfactory and effective way for carrying out the highest ideals of modern medicine. An executive committee to carry forward the work of the conference was appointed by the chairman, consisting of Drs. Fitzpatrick, Olin and Woodward.

## THE FEDERATION OF AMERICAN SOCIETIES FOR EXPERIMENTAL BIOLOGY

THE Federation of American Societies for Experimental Biology held its tenth annual meeting in Toronto, Canada, December 27, 28 and 29, under the auspices of the University of Toronto. This meeting was one of the most successful ever held, due largely to the carefully laid plans of the local committee. The local committee was composed of Professors Andrew Hunter, *chairman;* V. E. Henderson, *secretary;* V. J. Harding and H. B. Speakman. The total registered attendance was 244, made up of 134 members of the federation and 110 non-members.

In the absence in China of Dr. Donald D. Van Slyke, president of the American Society of Biological Chemists, the vice-president, Professor Philip A. Shaffer, Washington University Medical School, served as chairman of the federation. The biochemical secretary, Professor Victor C. Myers, New York Post-Graduate Medical School, was the executive secretary.

A joint session dealing with topics of general interest was held on Wednesday morning, December 27. The dinner on the same evening was in honor of the birth of Louis Pasteur. Following the address of welcome by Sir Robert Falconer, president of the University of Toronto, Professor Graham Lusk spoke on

Pasteur, the man, Professor F. G. Novy considered Pasteur's contributions to bacteriology, while Professor A. P. Mathews gave a brief account of Pasteur's contributions to chemistry. Thursday afternoon was given over to a long series of interesting and important demonstrations, two of which were given by Professor R. Barany, of the University of Upsala. The papers on the joint program of the final afternoon all dealt with the pancreatic hormone, insulin, chiefly with its nature and action. This session attracted a great deal of interest and was a fitting climax to the meetings, especially since this work was first inaugurated at the University of Toronto.

The individual meetings of the four constituent societies were held on Wednesday afternoon and Thursday and Friday mornings. A meeting of the Annual Conference of Biological Chemists was held on Thursday evening.

The officers of the four societies elected for 1923 are as follows:

American Physiological Society: *President*, A. J. Carlson; *secretary*, C. W. Greene; *treasurer*, Joseph Erlanger; *new members of the council*, Arno B. Luckhardt, John R. Murlin.

American Society of Biological Chemists, Inc.: *President*, Philip A. Shaffer; *vice-president*, Henry C. Sherman; *secretary*, Victor C. Myers; *treasurer*, Walter R. Bloor; *additional members of the council*, Andrew Hunter, Harold C. Bradley, Albert P. Mathews; *nominating committee*, C. L. Alsberg, S. R. Benedict, Otto Folin, Walter Jones, E. C. Kendall, P. A. Levene, J. R. Murlin, F. P. Underhill, D. W. Wilson.

American Society for Pharmacology and Experimental Therapeutics: *President*, C. W. Edmunds; *secretary*, E. D. Brown; *treasurer*, Hugh McGuigan; *additional members of the council*, P. J. Hanzlik, H. G. Barbour; *membership committee*, T. Sollmann, Carl Voegtlin, R. A. Hatcher.

American Society for Experimental Pathology: *President*, Eugene L. Opie; *vice-president*, A. S. Warthin; *secretary-treasurer*, Wade H. Brown; *councilors*, G. H. Whipple, H. Gideon Wells.

The executive committee of the federation is composed of the presidents and secretaries of the four societies. For 1923 the chairmanship and executive-secretaryship falls to the Pharmacological Society, Professor C. W. Edmunds, University of Michigan, being chairman, and Professor E. D. Brown, University of Minnesota, executive secretary.

The executive committee voted to hold the 1923 meeting in St. Louis.

## THE JAPANESE MEDICAL COMMISSION

A RECENT cable dispatch from Tokyo announces the appointment of Baron Yoshihiro Takagi, chief surgeon and professor of surgery in the Tokyo Charity Hospital and Medical College, as a member of a commission of six Japanese doctors who will arrive in the United States early in March as guests of the Rockefeller Foundation for the purpose of studying American and Canadian medical institutions and methods.

The commission was appointed by the Japanese minister of education, Dr. Eikichi Kamada, to whom the foundation's invitation was extended by President Vincent through Baron Shidehara, the Japanese ambassador at Washington. Nominations for membership in the commission were made by the Japanese Committee for Graduate Medical Education in the United States, headed by Baron Sakatani, under whose auspices a number of Japanese physicians have pursued post-graduate studies in the United States. The six members of the commission are:

Dr. Kinnosuke Miura, professor of medicine, Tokyo Imperial University, the leading internist and diagnostician in Japan, and a specialist in neurology; he is physician in ordinary to the emperor, and accompanied the Japanese delegation to Versailles.

Dr. Sahachiro Hata, professor of medicine, Keio University, and director of the Kitasato Institute; collaborator with Ehrlich in the discovery of salvarsan, and a distinguished biological chemist.

Dr. Keinosuke Miyairi, dean of the medical college, Imperial University of Kyushu, a parasitologist.

Dr. Mataro Nagayo, professor of pathology and pathological anatomy, Tokyo Imperial University.

Dr. Akira Fujinami, professor of pathology and pathological anatomy, Kyoto Imperial University.

Baron Yoshihiro Takagi, chief surgeon and professor of surgery in the Tokyo Charity Hospital and Medical College.

The commission as a whole, or individual members, will visit the leading hospital and research centers in the United States and Canada, including New York, Philadelphia,

Baltimore, Boston, St. Louis, Cleveland, Chicago, Rochester, Minn., Montreal and Toronto.

## THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

PRESIDENTS and recorders of the sections of the British Association for the Advancement of Science have been appointed for the Liverpool meeting to be held in September under the presidency of Sir Ernest Rutherford as follows:

Section A (Mathematical and Physical Science): Professor J. C. McLennan; Professor A. O. Rankine, Imperial College of Science and Technology, S.W.7.

Section B (Chemistry): Professor F. G. Donnan; Professor C. H. Desch, The University, Sheffield.

Section C (Geology): Dr. Gertrude Elles; Dr. A. R. Dwerryhouse, Toots, Darell Road, Caversham, Reading.

Section D (Zoology): Professor J. H. Ashworth; Professor R. D. Laurie, University College, Aberystwyth.

Section E (Geography): Dr. Vaughan Cornish; Dr. R. N. Rudmose Brown, The University, Sheffield.

Section F (Economics): Sir W. H. Beveridge; Professor H. M. Hallsworth, Armstrong College, Newcastle-on-Tyne.

Section G (Engineering): Sir H. Fowler; Professor G. W. O. Howe, The University, Glasgow.

Section H (Anthropology): Mr. P. E. Newberry; Mr. E. N. Fallaize, Vinchelez, Chase Court Gardens, Enfield, Middlesex.

Section I (Physiology): Professor G. H. F. Nuttall; Professor C. Lovatt Evans, Physiological Laboratory, St. Bartholomew's Medical College, E.C.1.

Section J (Psychology): Mr. C. Burt; recorder not yet appointed.

Section K (Botany): Mr. A. G. Tansley; Mr. F. T. Brooks, 31 Tenison Avenue, Cambridge.

Section L (Educational Science): Professor T. P. Nunn; Mr. D. Berridge, The College, Malvern.

Section M (Agriculture): Dr. C. Crowther; Mr. C. G. T. Morison, School of Rural Economy, Oxford.

## SPENCER FULLERTON BAIRD

THE one hundredth anniversary of the birth of Baird was commemorated at a meeting held in the auditorium of the United States National Museum on February 3. The Honorable Frank L. Greene, member of the House of Representatives and member of the board of regents of the Smithsonian Institution, presided, and addresses were given as follows:

"Baird the Man," Dr. William Healey Dall; "Baird and the Smithsonian Institution and its branches," Dr. Charles Greeley Abbot; "Baird at Woods Hole," Professor Edwin Linton; "Baird and the fisheries," Professor David Starr Jordan; "Baird the naturalist," Dr. Clinton Hart Merriam.

The meeting had been arranged by the National Baird Memorial Committee, of which the officers were as follows: *Honorary president,* Dr. William H. Dall; *president,* Dr. Charles D. Walcott; *vice-presidents,* Mr. George R. Agassiz, Dr. Alexander Graham Bell (deceased), Professor Frank W. Clarke, Professor Stephen A. Forbes, Professor David Starr Jordan, Professor Edwin Linton, Professor Edward S. Morse, Professor Henry Fairfield Osborn, Professor Addison E. Verrill and Dr. Robert S. Woodward; *secretary,* Dr. Paul Bartsch.

The membership of the committee included representatives of fifty-four scientific societies and other organizations. At the close of the meeting the report of the committee was presented by Dr. L. O. Howard. It included the following recommendations:

*First:* That the Congress be memorialized to establish in the city of Washington a museum of fisheries and oceanography, a laboratory and a public aquarium as a memorial to Spencer Fullerton Baird.

*Second:* That there be established a fund for the encouragement of research and exploration in the direction in which Spencer Fullerton Baird was a leader.

*Third:* That the name of Baird be given to the laboratory of the Bureau of Fisheries at Wood's Hole, Massachusetts.

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## SCIENTIFIC NOTES AND NEWS

SECRETARY HOOVER has appointed the board of visitors of the United States Bureau of Standards for a period of three years as follows: President F. W. McNair, of the Michigan College of Mines; Dr. Ambrose Swasey, of Cleveland, Ohio; Dr. John R. Freeman, of Providence, Rhode Island, a consulting engineer; Professor Wilder D. Bancroft, of Cor-

nell University, and Dr. Samuel W. Stratton, formerly director of the bureau and now president of the Massachusetts Institute of Technology.

The portrait of Professor A. A. Michelson, for thirty years head of the department of physics at the University of Chicago, has been completed by Ralph Clarkson, of Chicago, and turned over to the University of Chicago. The portrait was provided by the gifts of Professor Michelson's colleagues, former students, and other friends. It will be hung, temporarily, in the Quadrangle Club.

In honor of the seventy-fifth birthday of Professor Flügge, who was for many years the director of the Hygienic Institute in Berlin, Professor Kayserling, of the Robert Koch Foundation for Combating Tuberculosis, has founded a Flügge fund for tuberculosis research.

The council of the Geological Society, London, has this year made the following awards: Wollaston Medal, Mr. W. Whitaker; Murchison Medal, Dr. J. Joly; Lyell Medal, Mr. G. F. Dollfus; Bigsby Medal, Mr. E. B. Bailey; Wollaston Fund, Mr. H. H. Read; Murchison Fund, Mr. T. H. Withers; Lyell Fund, Dr. W. T. Gordon and Dr. W. N. Benson.

We learn from *Nature* that the Buys Ballot Medal founded in 1888 in commemoration of the work of C. H. D. Buys Ballot, the famous meteorologist of the Netherlands, to be awarded by the Royal Academy of Science at Amsterdam first in 1893, and afterwards every tenth year, to the person who is judged to have made the most valuable contributions to the science of meteorology, is to be given this year to Sir Napier Shaw, professor of meteorology in the Royal College of Science, lately director of the Meteorological Office, for contributions to all branches of the science, and specially for his work as president of the International Meteorological Committee. The previous awards were: 1893, Dr. Julius Hann, of Vienna; 1903, Dr. R. Assmann and Dr. A. Berson, of Berlin, jointly; 1913, Dr. H. Hergesell, of Strasbourg.

Professor George E. Beggs, of the School of Engineering of Princeton University, has been presented with the Watson Medal of the American Concrete Institute for the year 1922. This medal is awarded for the most meritorious paper presented before the institute during the year. Mr. Beggs's paper, on "The mechanical solution of indeterminate structures," discusses the method of designing indeterminate structures in concrete and steel by solutions obtained from models made of cardboard and celluloid.

Dr. Warren P. Lombard, for twenty years professor of physiology at the University of Michigan, will retire in June. Dr. Lombard has been appointed professor emeritus and will retain a laboratory in the medical school. The following resolution was passed by the board of regents: *"Resolved,* That in accepting the resignation of Dr. Warren P. Lombard, the board desires to record its deep appreciation of his long and distinguished service to the university and to science. He has contributed much to the social and official life of the institution, always cheerfully and efficiently."

Mrs. Anna Botsford Comstock, until 1921 professor of entomology at Cornell University, has been nominated for trustee of the university. Mrs. Comstock was nominated in 1922, losing by a narrow margin, but polling a higher vote than any previous winner.

Dr. Borden S. Veeder, professor of clinical pediatrics at Washington University School of Medicine, has been named as a director of the new American Child Health Association.

Dr. Marston T. Bogert, professor of organic chemistry, at Columbia University, has been appointed referee in chemistry for the American Field Service Fellowships for French Universities.

Dr. Francis H. McCrudden, professor of therapeutics at Tufts Medical School, has been made chief of the medical service of the U. S. Public Health Service Hospital, Washington, D. C.

Professor Vladimir Karapetoff, of Cornell University, has been granted leave of absence for the second term of this year.

Dr. Pentti Eskola, who has been engaged in research work at the Geophysical Laboratory, Carnegie Institution of Washington, for the past eighteen months, has returned to Fin-

land to undertake work for the Geological Survey of that country.

PROFESSOR JAMES GLOVER, of the department of mathematics of the University of Michigan, has accepted an invitation to give a lecture under the auspices of the DeLamar foundation on February 19 before the School of Hygiene and Public Health of the Johns Hopkins University. He will speak on "Life tables as applied to public health problems."

ON February 13, Dr. George T. Moore, director of the Missouri Botanic Garden, St. Louis, will speak before the Chamber of Commerce Forum on "The civic value of the botanic garden."

PROFESSOR JOSEPH JASTROW, of the University of Wisconsin, on the invitation of the department of psychology at Clark University, gave a public lecture on January 27, on "Spirit belief, occult and scientific."

DR. CHARLES WARDELL STILES, professor of zoology in the United States Public Health Service, has recently given three lectures before the Journal Club of the department of medical zoology, School of Hygiene and Public Health, Johns Hopkins University, as follows: January 12, "The public health aspects of trichinosis"; January 19, "The attitude of the Public Health Service toward clonorchiasis"; and January 26, "Surveys of intestinal protozoa."

PROFESSOR HELLPACH, instructor in psychology at the polytechnic in Karlsruhe, now minister of public instruction in Baden, delivered last month an address before the Heidelberg Society of Science and Medicine on the influence of heredity and environment on physiognomy or facial expression.

AT a joint meeting of the Washington Academy of Science with the Geological Society of Washington on January 24, M. E. De Margerie, director of the Geological Survey of Alsace-Lorraine, delivered an address on "The structure of the Alps."

THE annual council meeting of the British National Union of Scientific Workers was held at the Caxton Hall, Westminster, on January 13. Dr. A. A. Griffith, who presided, gave an address on "The support and utilization of science. Dame Helen Gwynne-Vaughan was elected president.

THE St. Louis Chapter of the American Library Association met at the library of the Washington University School of Medicine, on January 24, 1923. Dr. H. S. Gasser, professor of pharmacology, spoke on "William Beaumont," the pioneer American physiologist; Dr. Major G. Seelig, professor of clinical surgery, spoke on "Personal recollections of Professor Julius Pagel." The Beaumont collection of manuscripts and books and the Pagel collection on the history of medicine were on exhibition.

THE Royal Society of Medicine celebrated the Jenner centenary on January 26 when Sir William Hale-White gave an address on "Jenner and his work."

THE Oklahoma Academy of Science will hold its annual meeting at the University of Oklahoma on February 10. One of the main features of the meeting, in addition to the reading of scientific papers showing research work done in the state, is the celebration of the one hundredth anniversary of the birth of Gregor Mendel and Louis Pasteur. The celebration will be held at a noonday luncheon, at which members of the academy will discuss the contributions these men made to science.

PROFESSOR GEORGE LEFEVRE, chairman of the department of zoology in the University of Missouri, died at his home in Columbia, Mo., on January 24. He had been suffering from a cold, but was comfortable and in the best of spirits until January 18, when he left the laboratory complaining of renewed discomfort. His illness was pronounced influenza and later pneumonia. On January 21 his condition was serious and after a slight rally on the day following he sank rapidly until the end. The burial was in Columbia on January 26. A further notice regarding his life and personality will appear in a subsequent number of SCIENCE.

DR. JOHN BERRY HAYCRAFT, emeritus professor of physiology in the University of Wales, died at Royston on December 30, aged sixty-five years.

GIFTS of $1,000,000 each have been made by the Rockefeller Foundation and the Carnegie

Corporation to the New York Academy of Medicine. A part of the money is to be used in erection of a twelve-story building for the academy, which is planning an enlarged program for the medical profession and for the instruction of the public in preventive medicine.

DR. MAX NORDAU, the German philosopher, author of "Degeneration," died in Paris on January 23, in his seventy-fourth year.

THE Journal of the American Medical Association states that the University of Toronto is in urgent need of $60,000 to purchase "insulin" for treatment of the thousands of people suffering from diabetes who are daily applying for treatment. The chairman of the university committee on insulin, Colonel A. E. Gooderham, considers that the problem of funds for the purchase of insulin is one that should be settled by the provincial government. At present, only about twenty patients can be treated each day.

ANNOUNCEMENT was made at the meeting at Atlantic City of the American Roentgen Ray Society of an offer of a $1,000 award by the American society for the best original research in the field of X-ray, radium or radio activity. The competition will close July 1, 1923, and the prize will be awarded by a committee consisting of Dr. George E. Pfahler, Philadelphia; Dr. Frederick Baetjer, of Baltimore, and Dr. George W. Holmes, of Boston.

THE *Gorny Journal*, relating to the mining industries of Russia, and first issued in 1825, has resumed publication. It was supplanted in 1917 by official sheets of the labor organizations, but in its January-February issue of Volume 98 (1922) it returns to its original form. The board in charge of its publication includes a majority of members who were at the head of mining affairs before the revolution, as well as a considerable number of professors of the Petrograd Institute of Mines.

THE preparation by the Paris Academy of Sciences under the direction of M. Lacroix, permanent secretary, of a bibliography of the periodicals to be found in the various libraries of Paris has been completed and is now in press. Fifty thousand francs are required to pay expenses. Of this sum, nine thousand francs have been received in gifts and the academy has added fifteen thousand francs taken from the Foundation Lontreuil.

A REGULAR meeting of the American Physical Society will be held in Fayerweather Hall, Columbia University, New York, on Saturday, February 24. If the length of the program requires it, there will also be sessions on Friday, February 23. Other meetings for the current season are as follows: April 20-21, Washington. Pacific Coast Section; place not yet determined. November 30, Chicago. Annual meeting.

## UNIVERSITY AND EDUCATIONAL NOTES

PLEDGES amounting to approximately $1,000,000 have been given for the establishment of a non-sectarian school of religion for the University of Michigan.

TWO science buildings are being completed at Pomona College, Claremont, California. The Mason Hall of Chemistry, made possible through the generosity of a trustee, will cost $275,000, including adequate provision for its endowment. The Crookshank Hall of Zoology is being erected at a cost of $100,000.

THE China Medical Board of the Rockefeller Foundation has made a conditional gift of $75,000 to the Peking Union Medical College for the erection of one of the two science halls which are provided for in the plans for a group of buildings to be erected on a 300-acre site. The gift is contingent on the raising of an equal amount for the erection of the other science hall. A campaign to raise the $1,000,000 necessary for the erection of the new buildings was recently launched by L. Leighton Stewart, president of the university.

DR. WILLIAM S. MCCANN, associate professor of medicine at Johns Hopkins University, has been appointed professor of medicine at the University of Rochester Medical School.

M. PAILLOT has been appointed to the newly established chair of experimental physics at the University of Lille.

DR. L. E. ROBERTS, physical chemist at the U. S. Bureau of Mines, has accepted the posi-

tion of assistant professor of chemistry at the University of Arizona, to fill the position vacant by the death on November 21 of Professor B. Tatarian.

M. LASSOUR has been appointed professor of microbiology at the University of Nancy.

## DISCUSSION AND CORRESPONDENCE

### THE STARCH GRAIN

TO THE EDITOR OF SCIENCE: The article by O. L. Sponsler on "The structure of the starch grain" in the November issue of the *American Journal of Botany* is of more than ordinary interest. If we understood the structure of the starch grain and could produce it artificially in the laboratory it would mark the beginning of our intimate knowledge of biological problems.

The starch grain is elusive and one may study hundreds of specimens and yet not have the typical specimen revealing its intimate structure. Some years ago I obtained a hint from Fischer's work on Inulin. Late on a summer's afternoon I went to the laboratory and treated all of the starches which I had with aniline dyes. The mixtures were allowed to spontaneously evaporate over night and I obtained specimens which showed without doubt the complex nature of the grains. This was particularly true of potato starch. As I had a quantity of the stained material, I supplied all who wished specimens and it was not until a year or more later when I attempted to repeat the experiments, that I could not confirm my original work. I then very carefully attacked the problem in much the same way as I had studied the continuity of protoplasm, but to no avail. I worked for several years trying to repeat these experiments but have never succeeded since.

Mr. Sponsler has studied the starch grain using X-rays in much the same way that Herzog and Jancke had done in the study of the cell wall. Mr. Sponsler's attack of this problem is of very great scientific interest and while his results seem to indicate that the starch grain does not have a crystalline structure, I doubt if the results are conclusive. As I have shown, there is a substance in the grain which is dextro-rotatory and it is not at all difficult to observe starch grains which show, as pointed out by Meyer and Schimper, a spherocrystal structure.

HENRY KRAEMER
KRAEMER LABORATORIES,
MT. CLEMENS, MICHIGAN

### WHAT IS A PLANT?

THE writer has unsuccessfully sought for a definition of the term *plant* suitable to use when introducing the subject of botany to college classes. The definitions given in the dictionaries are all unsatisfactory. According to Webster's International Dictionary (1922), a plant is "any member of a group of living organisms exhibiting irritability in response to stimuli, though generally without voluntary motion or true sense perception." Funk and Wagnall's Standard Dictionary (1913) defines a plant as "an organized, non-sentient being endowed with vegetable as distinguished from animal life." Both definitions, but particularly the latter, recall Linnæus' distinction, long discarded, of plants as structures that grow and live, while animals grow, live and feel. The definition given in Jackson's Glossary of Botanic Terms (3rd ed. 1916)—"a vegetable production, nourished by gases or liquids and not ingesting solid particles of food"—is even more unfortunate. The text-books are still more vague, commonly not even attempting a definition, but plunging abruptly into a discussion of the special characteristics of plants.

In the belief that a concise, clear-cut definition of the term is of very definite value to the beginning student, the writer ventures to present to his colleagues for their criticism the following definition which he has been using in his classes: *A plant is an organism possessing chlorophyll or descended from chlorophyll-possessing ancestors.* This definition, given at the outset, makes the method of nutrition the primary basis for distinction between the two groups, the other differences being naturally presented as in large measure the consequence of this fundamental difference. At the same time, it provides for the inclusion of the non-green plants and places significant emphasis, at the very beginning of the course, upon the idea of evolution. Bacteria, except possibly certain of the higher filamentous forms, are excluded. In view of the power of chemosynthesis possessed by certain members of that group, and of the very plausible possibility that they

antedate any distinction between plant and animal life, this is desirable. The present equivocal position of the slime moulds is not affected.

This definition is not presented with the expectation that it will prove entirely satisfactory, but rather with the hope that it will call forth a better. Possibly such a definition has already been published. If so, it has been strangely overlooked by the writers of our textbooks.

George W. Martin
Rutgers College

## MUSCA LINNÆUS, 1758, AND CALLIPHORA DESVOIDY, 1830

In accordance with the Rules of the International Zoological Congress, the attention of the zoological profession is invited to the fact that Dr. L. O. Howard, W. Dwight Pierce and twenty-one other professional zoologists have requested the International Commission on Zoological Nomenclature to exercise its plenary power in the case of the Linnæan genus *Musca* 1758, and, under suspension of the Rules, to declare *M. domestica* as type of this genus, also, under suspension of the Rules, to validate *Calliphora* Desvoidy, 1830, with *C. vomitoria* as type.

The request is based on the grounds of practical utility, and an almost unbroken history of consistent usage since 1758 in the case of *Musca*, and since 1830 in the case of *Calliphora*. It is claimed that a strict application of the Rules will produce greater confusion than uniformity.

According to the premises at present before the commission, if the Rules are strictly applied, the generic name of *Musca* would take either *M. cæsar* or *M. vomitoria* as type, and the species *M. domestica* would be cited either in *Conostoma* 1801 [?] (type *Ascaris conostoma* = larva of *M. domestica*) or in *Promusca* 1915 (type *M. domestica*), thus resulting in a very regrettable change in the nomenclature of the species in question as almost universally used in entomological, zoological, medical, epidemiological and veterinary literature.

The secretary of the commission invites any person interested in these cases of nomenclature to communicate his opinion on the subject as soon as possible, and not later than May 1, 1918,[1] when the subject will be submitted to the commission for vote.

C. W. Stiles,
*Secretary to Commission*
Twenty-fifth and E Streets, N. W.,
Washington, D. C.

## THAT CHEMICAL "CRAMMING" MATCH

Professor Jacobson's spelling match, a cue word device adopted by many students when cramming up for an examination, prompts me to record a remark made a quarter of a century ago by one of our greatest chemists. Said he "I once had a student who could repeat every chemical formula in all the books, but I never could teach the damned fool a thing about chemistry."

W. J. Humphreys

## WARNING

A man calling himself Walter F. Clarke and representing himself as my nephew is reported as seeking financial accommodation from my colleagues throughout the country. I have no such nephew and I know no person of that name.

John M. Clarke
State Museum,
Albany, N. Y.

# QUOTATIONS

## THE NEW FRONTIERSMEN

The comments received regarding the reports in the *Times* of the meeting of the American Association for the Advancement of Science are such as to give encouragement to those men of science who are the new frontiersmen of our civilization. They are the men of the lens and the meter, of the balance and the crucible, of the magnet and the spectrum, of the atom and the electron, of the syllogism, the equation, the theorem, the statistic. They are no less the frontiersmen, the precursors, than this republic's early pioneers of the axe, the plow, the rifle and the saddle. They who have patiently enlarged the borders of truth are as deserving sons of democracy as they who have pushed out the physical bounds between the desert and the sown.

[1] On account of delay caused by the war, final vote will not be taken until about January 1, 1924.

Day after day, these new pioneers—frontiersmen even in the midst of the great cities—are out in search of bacteria, which are what the wild beasts or savages were to the early settlers, or the elusive element or the invisible principle or the pervasive but unformulated law. And night after night they venture forth over the universe's quadrillions of miles as hunters in the skies to bring back fresh bits of stellar truth to the earth. To rank such service with that of the old frontiersmen of the western solitudes and to let its findings take their place in the most important news of the day is one of the very encouraging signs in a democracy about which so many disparaging observations are made.

The privation of the new frontiersman is not as a rule that of living far from neighbors and friends, of enduring untempered cold or withering heat, or of going without sufficient food. It is the hardship of holding one's self to a course of study or research that will lead out beyond the edge of the known, the privation of denying one's self every comfort to find what the truth is and the suffering of following wherever the truth leads. When the public put such men among their greatest citizens, as the people of France put Pasteur, there need be less anxiety about democratic ideals. But the scientists should take the great public into their confidence. If the scientist have not the ability to speak to the people, then he should have in his city laboratory or his field tent with him an interpreter, the reporter, one who can "merge scientific facts into new human relations." The reporter must also be a frontiersman.—*The New York Times.*

## SCIENTIFIC BOOKS

*The Mineralogy of Pennsylvania.* By SAMUEL G. GORDON. Special Publication No. 1, The Academy of Natural Sciences of Philadelphia, 1922, 255 + xiv pp., plate and text illust. 8vo.

"The Mineralogy of Pennsylvania" gives in an exceptionally clear and concise way all the essential data as to the geology and mineralogy of the state. The crystal forms are not only described but well illustrated, and for each of the many minerals one or more of the best analyses are presented. The book opens with a graphic historical outline. The first great inspiration to the science in Pennsylvania might be said to date from the pilgrimage made to the laboratory of Abbe Haüy in Paris by several Pennsylvania students, notably Adam Seybert, Gerard Troost (a native of Holland), and later by Lardner Vanuxen and William Keating, whom we may regard as the first scientific mineralogists of America. A powerful aid to the development of the study was the fine collection of minerals brought back from Europe by Adam Seybert.

The founding of the Chemical Society in Philadelphia in 1792, marks one of the earliest stages in this science and that of mineralogy in the United States. Following this came the organization of the Academy of Natural Sciences of Philadelphia, the first mineralogical accessions being some artificial crystals prepared by Dr. Troost. Later, Seybert's collection was acquired, and was lectured upon by Troost. Contemporaneously, in 1812, Isaac Lea published "An Account of the minerals at present known to exist in the vicinity of Philadelphia"; four years earlier, in 1808, Adam Seybert had issued his "Catalog of some minerals which are found in different parts of the United States." It is impossible to overestimate the inspirational value of these early writings.

"The Origin and Occurrence of Minerals" are treated on pp. 11-22. A synopsis of the classification of minerals according to their occurrence by Wherry and Gordon is given, followed by a discussion of each kind of deposit, with lists of the minerals of each assemblage. A new arrangement of the well-known classification of rocks after Rosenbusch, Kemp and Iddings is presented. Data of this chapter are not available elsewhere. General Geology of Pennsylvania: Here, on pp. 23-24, the geologic formations of the state are tabulated, with notes on the character of the rocks and their minerals. This is the most up-to-date and complete statement of the geology of the state that is available.

One hundred and fifteen pages (34-149) are devoted to a detailed description of about two hundred and fifty minerals found in the state. After the heading of each mineral, in which name, composition and crystal form are stated, the mineral is described in the following order: color, lustre, form, hardness, specific gravity,

and then crystallography, composition and localities in Pennsylvania. A large number of crystal figures illustrate this part.

The mineral localities are listed according to counties and thence according to townships (pp. 150-240). After a statement of the exact situation of a locality, based on Kemp's Coordinate System, the geology is briefly noted, followed by annotated lists of the minerals of the localities arranged usually in a genetic order, with complete references to the literature. On p. 176, Wheatly mines, there is a typical illustration of this method of arrangement. The date and place of the first publication of discovery is everywhere given.

Pennsylvania has been, strictly speaking, more a state of mineral collectors than any other in the United States. This centered about the city of Philadelphia for a period of fully sixty years and, although the men frequently were scientific mineralogists, yet they were intelligent collectors and did not confine themselves only to Philadelphia and the many localities about it, but brought together collections of the finest minerals in the world, notably the Clarence S. Bement Collection, forming the main part of the Morgan-Bement Collection of the American Museum of Natural History, the finest private collection ever gotten together.

Many of these collectors met at the home of the late W. S. Vaux on Saturday afternoons, and at the home of Clarence S. Bement on Sunday afternoons, for the exchange of ideas and to study the minerals and sometimes to exchange specimens.

Among these men were Colonel Joseph Wilcox; Dr. Joseph H. Leidy, the great biologist, who formed a fine collection of gems and several collections of minerals; George W. Fiss, who drifted into microscopic mineralogy; J. M. Cardeza, of Wilmington; Joseph Wharton, who founded the Wharton School at the University of Pennsylvania; John Hancock, whose collection was acquired by the Holden Fund for Harvard University; T. D. Rand; W. W. Jefferis, whose collection is now in the Carnegie Museum in Pittsburgh; Dr. George A. Koenig, who discovered the diamond in the Canyon Diablo meteorite; Dr. Joseph Genth, who analyzed many minerals, frequently with results that gave us original species. Thus we have the minerals, jefferisite, genthite, bememtite, footeite, randite, wilcoxite. There were a number of dealers, among the most important of whom were the late Dr. A. E. Foote and Joseph Pennypacker, of West Chester, Pa.

Wharton gave his name to the Wharton School, and W. S. Vaux[1] left his collection to the Academy of Natural Sciences in Philadelphia, and the Vaux collection was the pride of the academy's splendid display of minerals.

Had it not been for this early interest in mineralogy and the number of interesting localities in Philadelphia and the nearby region, this group of collectors would not have materialized, and mineralogic science would be without the many collections which came through them.

The magnificent pyrites and associated minerals from French Creek, the garnets and beryls from Avondale, the felspar from Media, the amethyst from Upper Providence, the great variety of zeolites from Philadelphia and its vicinity, the minerals of Delaware County, the pyro-morphite and wulfenite from Phœnixville, and the millerite from the Gap Mines, grace many of the finest collections in the world.

The great collection of Clarence S. Bement (died Saturday morning, January 27, 1923, at Philadelphia, Pa.) represented not only thirty years of assiduous collecting, but the buying of many collections—fifty or more minor collections—including the selection from the entire collection of Norman S. Spang which was the result of thirty years collecting by Norman Spang (died December 10, 1922) and his father before him. The latter visited the principal localities throughout England, Germany and Switzerland every year, whereas the son, because of his health, spent his summers in the Lake Superior region and his winters in Florida, which meant that he visited all the northern localities, North Carolina, Virginia and the eastern states generally.

This collection eventually became the property of the American Museum of Natural His-

[1] His nephew, George Vaux, inherited several dozen of the finest specimens, and has been a most assiduous collector and has financed the recent trip of Dr. Gordon to South America.

tory and really is Pennsylvania's offering to American mineralogy, as this is undoubtedly the finest collection of minerals in the United States and ranks among the two or three finest of the entire world. All the choicest specimens of the Spang collection were merged in the Bement collection by the purchaser and it is now known as the Morgan-Bement collection. Biographical notice of these two eminent collectors will appear later.

The listing of the mineral localities according to counties and then according to townships is very useful to those studying the minerals and their occurrence, and at the same time gives precise data where to look for the minerals themselves.

The bibliography of Pennsylvania's mineralogical literature is remarkably complete and there is an admirable index.

GEORGE F. KUNZ

## SPECIAL ARTICLES

### A POCKET DISSECTING SCOPE

THIS new dissecting device was designed for the purpose of providing a simple and efficient instrument for examining small megascopic objects such as are encountered by the general nature lovers and students in plant and insect systems. And also to provide a small compact instrument of this kind that could be easily folded and closed up and conveniently carried in the student's pocket.

Fig. I shows a simple sectional elevation of the pocket scope in working adjustment.

Fig. II gives a view of the instrument folded and closed.

The device when adjusted for work, Fig. I, is operated by holding it in the left hand, the forefinger resting upon the knurled surface (b) of the slidable and revolvable tweezer (5), and the thumb upon the tiltable focusing block (4). By a conjointed motion of the finger and thumb thus placed it is surprisingly easy, when the lens is held under the eye, to keep the object (f) in focus while it is being picked by means of a needle held in the right hand, or, revolved by the forefinger of the left hand to secure views of the object (f), from all angles.

A forward and backward movement of the thumb pressing upon the tiltable block (4), lowers and raises the lens (1). Thus focusing is made easy.

A movement of the forefinger at right angles on the knurled surface (b), revolves the tweezer in its socket (6), thus bringing to view the various portions of the object (f).

The tweezer rod (c), being slidable as well as revolvable in its socket (6), the object (f) can be easily adjusted laterally under the lens (1).

Section (7) is a hollow tube permanently closed at each end, to one of which is attached the lens and its operatives (1, 2, 3, 4, 5, 6). This section (7) is separably and invertibly insertable into section (8), (8) being an open hollow tube inwardly shouldered at each end to limit the extent of insertion of (7) and (9).

Section (9) is a tool box composed of a hollow tube closed at one end and containing tool sockets for holding dissecting instruments (10) at the other. This box is invertibly insertable into (8).

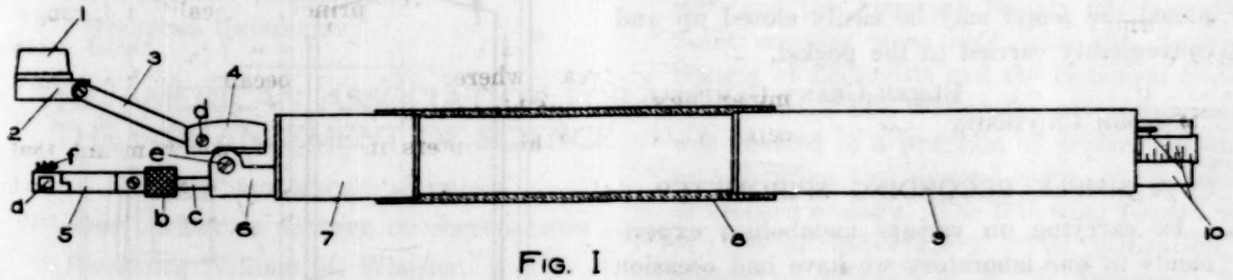



FIG. I

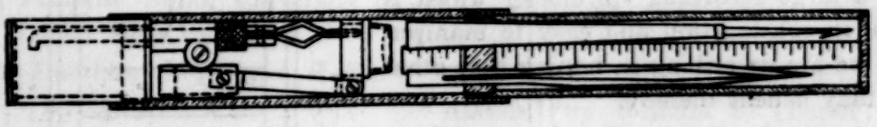


FIG. II

To change the instrument from the working adjustment, Fig. I, to the pocket adjustment, Fig. II, the lens (1), and its bar (3), is placed horizontally, then (7) is reversibly inserted so as to conceal the lens and its operatives in section (8).

Section (9) in like manner when reversibly inserted encloses the exposed tool handles (10), within the other end of section (8).

The instrument thus folded and closed, Fig. II, may be carried in the student's pocket.

The pocket scope comprises five distinct advantages for nature lovers and general taxonomists.

1. Quick general observation is easily obtainable by adjusting the lens as in Fig. I, and pushing the tweezer backwards in its socket so as to clear the space under the lens, and then using the body of the instrument, sections 7, 8, 9, as a handle.

2. Detailed observation is made easy and delightful by placing the object to be examined within the grasp of the tweezer jaws where it can be held firmly in an easily shiftable position for dissection.

On one jaw of the tweezer is a shallow cup (a), on the face opposite (a) is a fine sharp needle point.

The cup may be used when examining spores or small seeds, the needle point may be used for holding small insects, etc.

3. The right hand is free for picking the object and recording the facts observed.

4. The dissecting instruments are pleasingly accessible at the rear end of the scope (10).

5. When the dissecting or observation is completed the scope may be easily closed up and conveniently carried in the pocket.

ELMER GRANT CAMPBELL
PURDUE UNIVERSITY

## A SIMPLE RECORDING SPIROMETER

IN carrying on various metabolism experiments in our laboratory we have had occasion to make a large recording spirometer which is so simple in construction and easy to manipulate that we are describing it, hoping that other workers may benefit thereby.

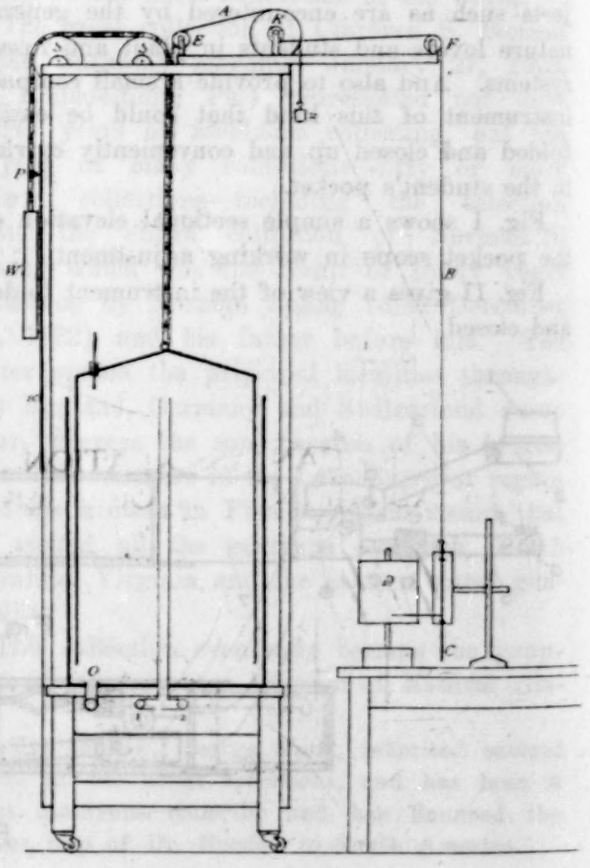
The outer tank consists of a large garbage can with inlet (I) and outlet (O) tubes one inch in diameter each provided with large stopcocks. The inlet tube has two vents (1 and 2) which facilitate emptying the air without disconnecting the breathing tube.

The float tank is made of thin sheet zinc and holds about 110 liters. A thermometer (T) records the temperature of the expired air.

We have made use of a much more simple plan than any spirometers we know of, to compensate for the additional weight of the float tank as it rises.

The Tissot type is cumbersome and should the tank fill rapidly complete compensation may not occur owing to the size of the siphon tube. The eccentric pulley type throws the line of support off center unless prevented by additional pulleys.

Our support consists of a roller sprocket chain. The weights, $W$ and $w$, exactly balance the float tank when it is submerged. The large weight is made of water pipe which is closed at the lower end. This makes possible the addition of shot until a correct balance is obtained. As the tank rises its additional weight is compensated by fewer links on the tank side and added links on the weight side. Weight is thus



gradually taken from the tank side and added to the weight side at a rate which maintains uniform balance. The size of the chain therefore depends on the size and thickness of the float-tank. In our instrument an ordinary roller bicycle chain is just sufficient to compensate.

The recording device consists of two threads so placed as to lift a stylus which records on the drum. One thread (*A*) is attached to the top of the float-tank and passes over two pulleys, *E* and *R*. This thread is kept taut by a small weight (*w*) of 25 or 50 grams. A second thread (*B*) is wound around a bobbin on wheel *R*, passes over pulley *F* and is attached to a light rod, *C*. This rod slides easily in a vertical direction and carries the writing stylus. As the float-tank rises, wheel *R* is turned round and the writing stylus lifted. The ratio of the circumference to the bobbin of pulley *R* is such that when one liter of air enters the spirometer the writing stylus is lifted one millimeter. The record thus shows not only the rate at which the tank is being filled and the number of expirations, but also the amount in liters of air at any time as represented by the number of millimeters the stylus has risen from the base line.

All the pulleys turn on cone bearings, which reduces the friction to a minimum. The roller chain is well oiled and offers very little resistance. The whole apparatus is so sensitive and so easy to manipulate by students without special training that we recommend it to others for general laboratory use.

J. R. SLONAKER
PHYSIOLOGICAL LABORATORIES,
STANFORD UNIVERSITY

## THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

### THE BIOLOGICAL SCIENCES

#### THE AMERICAN SOCIETY OF NATURALISTS

*President,* William M. Wheeler.

*Secretary,* A. Franklin Shull, University of Michigan, Ann Arbor, Mich.

*(Reports by A. Franklin Shull and Herbert W. Rand)*

The sessions of the American Society of Naturalists presented two unified programs. One was in celebration of the one hundredth anniversary of the birth of Francis Galton and Gregor Mendel, two outstanding figures in the development of biology, particularly genetics, in the past sixty years. The speakers on this program were E. M. East, T. H. Morgan, J. Arthur Harris and George H. Shull. The other program of this society was a symposium on geographic distribution of animals.

The annual dinner was one of the most successful and most largely attended the society has ever had. Following the dinner, Professor W. M. Wheeler, of the Bussey Institution of Harvard University, gave his presidential address on "Academic biology." At the close of the address Professor C. H. Eigenmann, of Indiana University, called upon informally, sketched a dream of a recent visit to Hades. He found that scientific men, condemned to this lower region by their mundane brethren of orthodox faith, had introduced an extensive refrigeration system and, by application of their scientific knowledge, had otherwise so improved the old place that living conditions were really better than in the abode of the blessed.

#### THE ECOLOGICAL SOCIETY OF AMERICA

*President,* Forrest Shreve.

*Secretary,* A. O. Weese, James Millikin University, Decatur, Ill.

*(Report by A. O. Weese)*

The Ecological Society of America held three independent sessions and three joint sessions, including a symposium on "Geographical distribution" with the American Society of Zoologists and the American Society of Naturalists. Joint sessions were held with the American Society of Zoologists and the Botanical Society of America. The Wednesday afternoon session was devoted to a program of papers presented by invitation and covered many of the phases of modern ecology. The following papers were of special importance: "The utilization of energy by plants," by E. N. Transeau; "Insects affecting stored food products as a source of ecological data," by Royal U. Chapman; "The recent ecological history of Glacier Bay, Alaska," by William S. Cooper; and "Maintenance of wild life in our national parks," by C. C. Adams.

The Thursday afternoon session was devoted to the reading of papers on aquatic problems, which were especially well represented in the program for this meeting. Copies of the *Bulletin* of the Ecological Society containing abstracts of papers may be obtained from the secretary.

At the business session the further support of the journal *Ecology* was provided for by an increase of dues to $4. The committee on the preservations of natural conditions reported that the *Naturalists' Guide* was approaching completion and asked for the appointment of a sub-committee to take care of the final phases of publication. Steps were taken leading toward the appointment of a committee to investigate the possibilities in regard to the preservation of the Glacier Bay region, Alaska, the value of which has been made known to the society by the work of Dr. William S. Cooper. The constitution of the proposed union of biological societies was ratified. The following officers were elected: *President,* Charles C. Adams, N. Y. State College of Forestry, Syracuse, N. Y.; *vice-president,* G. A. Pearson, Fort Valley Experiment Station, Flagstaff, Ariz.; *secretary-treasurer,* A. O. Weese, James Millikin University, Decatur, Ill.

### THE AMERICAN MICROSCOPICAL SOCIETY

*President,* N. A. Cobb.

*Secretary,* Paul S. Welch, University of Michigan, Ann Arbor, Mich.

*(Report by Paul S. Welch)*

The American Microscopical Society offered no program of papers, but held a business session only. The meeting included reports of the treasurer, custodian and secretary. The following officers were elected: *President,* Professor Chancey Juday, University of Wisconsin; *first vice-president,* Dr. B. H. Ransom, Bureau of Animal Industry; *second vice-president,* Dr. W. W. Cort, Johns Hopkins University; *secretary,* Professor P. S. Welch, University of Michigan; *treasurer,* Dr. William F. Henderson, University of Pittsburgh; *elective members of the executive committee,* Professor George R. La Rue, University of Michigan, Professor Z. P. Metcalf, N. C. State College of Agriculture and Engineering, and Professor E. M. Gilbert, University of Wisconsin; *Representatives on the A. A. A. S. Council,* Dr. B. H. Ransom, Bureau of Animal Industry, and Professor Paul S. Welch, University of Michigan; *Member of the Spencer-Tolles Fund Committee,* Dr. N. A. Cobb, Bureau of Plant Industry.

### JOINT GENETICS SECTION

*(The Botanical Society of America and the American Society of Zoologists)*

*Chairman,* H. S. Jennings.

*Secretary,* L. J. Cole, University of Wisconsin, Madison, Wis.

The geneticists met first for a discussion of the problems connected with fundamental research in the various agricultural institutions. This discussion was led by Professor John W. Gowen, of the University of Maine, and by Dr. E. W. Lindstrom, of Iowa State College.

The formal papers followed in the joint section of plant and animal genetics. A general tendency has been toward the attempt at modification of heredity by various environmental agents. There is indication that the course of hereditary transmission may be modified by such agencies as X-rays, as in the work of Dr. J. W. Mavor, who has been able to modify the distribution of hereditary factors in flies, and of Dr. C. C. Little, who has produced abnormalities in eyes, jaws and legs of mice, some of which are apparently inherited in a Mendelian manner. In the jimson weed, C. Stuart Gager, working in cooperation with A. F. Blakeslee, has brought about an increased number of mutations by the use of radium; and F. B. Hanson reported on the effects of alcohol on rats, with positive results in modification of sex ratio, litter size and body weight.

Hereditary differences in tendency to produce certain types of variation were also reported upon. Dr. Sewall Wright showed a series of head abnormalities in guinea-pigs which occurred in twenty per cent of the individuals of one line, about two per cent. in another, and not at all in others. Dr. A. A. Banta showed fluctuating variability in head form in water-fleas, Dr. P. W. Whiting reported on his investigations in the analysis of fluctuating variability in wing veins of parasitic wasps.

Papers on the control of sex were reported by Dr. A. A. Banta in water-fleas, and by Dr. Oscar Riddle in pigeons; and Dr. Heman L. Ibsen brought together extensive data on sex-ratio in guinea-pigs. A number of papers dealing with complications in Mendelian heredity were presented. Dr. C. B. Bridges showed the results of transposition of a part of one chromosome on to another, and Dr. A. Weinstein presented the method of measuring interference in linkage relationships. Dr. H. J. Muller described an efficient and practicable means of measuring the rate of mutation which may, with favorable material, make this difficult problem as easy as Mendelian analysis has been in the past.

Dr. C. E. Allen described a case of inheritance of a gametophytic character in *Sphærocarpus Donnellii*. This was of special interest, as it represents the first observed case of this type of inheritance. Dr. E. W. Lindstrom discussed two types of endosperm defects in maize. One, in Golden Bantam variety, acts as a simple recessive-defect, while the other in Yellow Flint corn, also recessive, is completely linked in inheritance with albino seedling character. In a second paper Dr. Lindstrom reported work done with Drs. L. J. Cole and C. M. Woodworth on selection for quality of oil in soy beans. High and low selection for drying quality of soy bean oil resulted in a significant separation of the two selection lines. Observations made by Dr. Karl Sax indicate that chromosomal relationships in *durum* and *vulgare* wheats are such that the possibility of ever combining their desirable qualities is very slight. Genetic results dependent upon multiple chromosome complexes in Datura obtained by Dr. A. F. Blakeslee and others were also presented. Dr. G. H. Shull presented evidence for partial linkage in *Œnothera*. This is contrary to the predictions of certain cytologists who had stated previously that crossing-over would not be possible in *Œnothera* on account of absence of synapsis.

### THE AMERICAN NATURE-STUDY SOCIETY

*President,* William G. Vinal.

*Secretary,* Mrs. Anna B. Comstock.

*(Report by Mrs. Anna B. Comstock)*

The seventeenth annual meeting proved to be the most extended and in many ways the most successful in the history of the society. The program consisted of nineteen numbers, completely filling the sessions of two days. It was quite remarkable that every one listed on the program was present and gave his or her address at its allotted time, except for a ten-minute talk by Professor Schuyler Mathews, who was ill and unable to attend the meeting.

Thursday morning Professor E. L. Palmer, of Cornell University, gave a vivid and comprehensive talk on the rapidly increasing use of nature-study in the various scouting organizations. Professor Palmer has done much work with the Boy Scouts and has adapted many valuable nature lessons for their use, so he spoke with full knowledge of the subject.

Miss Annie T. Washburn, supervisor of nature-study in the Princeton, N. J., schools, described some projects which she had inaugurated in the schools of Princeton, where many pupils from the rural districts attend. The pupils visited and studied the methods used in a model dairy and also those of a model farm; especially interesting was her account of the beginning and growth of the annual school fair which this year exhibited garden products, flowers, poultry and farm animals; her description of the way the difficulties of housing the exhibits were met and conquered was most inspiring.

Dr. Walter Wilson, of the biological department of Brown University, gave warning of dangers in much of our routine nature-study that pupils were not attracted to science as they should be and would be if the teaching were more vital.

The question, "What do I expect that nature-study should do for my child?" was discussed by a clergyman and a physician. The Rev. G. Manley Townsend, of Medfield, Mass., declared that the supreme thing that he expected of nature-study was that it should enrich and broaden the life of his child and made a stirring appeal for breadth in nature contacts. Dr. Henry P. Lovewell, of Providence, R. I., made a plea for nature-study as a means of improving the health and the practical knowledge of the child as well as of cultivating the senses.

Dr. George W. Field, of Sharon, Mass., gave an extensive discussion of nature-study in its relation to national problems of conservation. Dr. Field spoke from the fullness of his expe-

rience as a member of the Biological Survey in charge of the Federal and Game Reservation and from his experience in Brazil. He outlined the many ways that nature-study may assist in practical conservation and also in moulding public opinion.

Professor Van Evrie Kilpatrick, director of school gardens in New York City, maintained that all of the various organizations of nature-study and gardening be combined and work together under the name of nature education. Anna Botsford Comstock, of Cornell University, supplemented this by explaining the work of certain courses given at Cornell which combined gardening and nature-study.

The Friday morning session began with a most enlightening review of the phases of the growth of nature-study by that veteran in the field, Professor Arthur C. Boyden, principal of the State Normal at Bridgewater, Mass. He traced the zigzag progress of the movement in a masterly manner and gave his very cogent reasons for his confidence in its future use and development.

Mr. Charles M. Lamprey, director of the Model School of the Boston Normal School, gave a most practical talk upon the growing of bulbs both indoors and outdoors. He gave the reasons for growing bulbs in schoolhouse and garden and told the types of bulbs best fitted for this purpose and methods of treatment.

Professor Clarence E. Allen, director of the Country Day School, Newton, Mass., gave an illuminating address on the opportunities the day school offers to interest the sons of wealthy parents in wholesome out-of-door activities that may lead to an interest in the sciences and the problems of conservation and other subjects of public interest.

Miss Breta W. Childs, teacher of nature-study in the Normal School at Worcester, Mass., gave a practical and helpful address upon the need for gardening as an intermediate grade subject in city schools. Miss Childs illustrated her argument with her personal experiences, which were most convincing and helpful.

Mr. Charles S. Preble, teacher of nature-study in the Normal School at Farmington, Maine, gave methods for correlating the brook and pond with the aquarium and showed how the study of the one led to the study and understanding of the other. His suggestions were detailed, practical and helpful.

Miss Gertrude B. Goldsmith, teacher of nature-study in the Normal School of Salem, Mass., gave a scholarly and thoughtful address on nature-study as a means of education for leisure.

The Friday afternoon session began with an interesting address by Miss Fannie A. Stebbins, supervisor of nature-study, Springfield, Mass. Miss Stebbins gave a detailed account of the project carried on by her pupils which was termed the Bird Hospital. The most interesting patient in this hospital was a lamed heron; the children in feeding and caring for their patient made field studies of insects, toads and frogs, fishes and many other creatures and learned much of their habits and environment; they also became acquainted with the game laws and staunchly defended them. Miss Stebbins showed conclusively that if one phase of nature be well studied, it leads to other phases.

Miss Pearl McCoy, teacher of nature-study at the Bridgewater, Mass., Normal School, gave a clear-cut and wise talk upon the proper correlation of nature-study with English composition. She stressed the oral exercises and the child's interest in telling about his pets or his observations of birds and animals in the field.

Dr. Marion D. Weston, of the Rhode Island College of Education, discussed the value of nature hobbies to people in general, and gave many practical suggestions as to methods of interesting people in special lines of plant or animal study, all based upon her own experience in the Rhode Island Field Naturalists' Club.

Mrs. Helen H. Neal, who is a director of nature lore in the Gulick camps, spoke with great earnestness of the importance and methods of interesting young children in nature.

The session ended with an illustrated lecture on John Burroughs by Dr. G. Clyde Fisher, of the American Museum of Natural History. Dr. Fisher had the privilege of a long and intimate association with Burroughs and has used his skill as a photographer with great success. The slides were made from Dr. Fisher's negatives and colored by an artist and are as vivid in portraying scenes in the life and surroundings of the great naturalist as

they are intrinsically beautiful. Dr. Fisher's talk was full of interesting personal recollections of Mr. Burroughs and a fitting accompaniment for the pictures. It is most fortunate that through the devotion of Dr. Fisher we have this living monument to the life of the one whom all of us love through his books.

On Thursday evening more than fifty members of the society gathered at the Bellevue to take part in the dinner given in honor of their long-time secretary, Mrs. Anna B. Comstock. Dr. Clarence Weed, principal of the State Normal at Lowell, Mass., was a most happy toastmaster, and Dr. L. O. Howard, U. S. entomologist, and Dr. Vernon L. Kellogg, head of the National Research Council, were the chief speakers. The following also spoke: Dr. W. G. Vinal, Dr. G. W. Field, Dr. Maurice Bigelow, Dr. E. L. Palmer, Dr. G. C. Fisher, Miss Theodosia Hadley and Professor J. L. Randall.

Professor William G. Vinal, of the Rhode Island College of Education, was reelected president for the coming year and Mrs. Comstock was elected secretary editor.

SECTION K—SOCIAL AND ECONOMIC SCIENCES

*Vice-president and Chairman,* Henry S. Graves.

*Retiring Vice-president,* James Mavor.

*Secretary,* Frederick L. Hoffman, Babson Institute, Wellesley Hills, Mass.

*(Report by F. L. Hoffman)*

The program of the Section of Social and Economic Sciences was thoroughly representative of the subject matter under consideration, "The more effective conservation of our natural resources."

The introductory address by the retiring vice-president, Professor James Mavor, of the University of Toronto, was a very thoughtful contribution on the question, "Certain economic reactions of the war." The paper considered the growth and movements of population, the development of transportation, movements of prices and currency statements, wages and conditions of labor, movements of capital, public opinion regarding the limits of the functions of the state, etc.

Regarding state functions, Professor Mavor said in conclusion that "not all, but nearly all of these emergency functions have since been removed from the state, in spite of a certain amount of protest on the part of those who adhered to the policy of collectivism. The practical experience of the exercise of a policy of nationalization and national control seems to have been, on the whole, adverse to that policy." And finally that "while the war has thus exercised an influence in numerous economic fields, and while in some of these the influence has been important, it is essential to attribute to the war and to the peace which followed, only those reactions which clearly can be traced to them."

The second paper, which attracted nation-wide attention, was on "The conservation of human energy," by Dr. Thomas S. Baker, acting president of the Carnegie Institute of Technology. One particular phase, which was much appreciated, was the statement that "optimism is an essential in the conservation of our present stock of human energy, if by this we mean the power that has produced and is keeping alive our present civilization."

The morning session of December 27 concluded with two strong papers on "The conservation of labor power through insurance," by Mr. W. F. Chamberlain, of Hartford, and on "The conservation of health," by Dr. Eugene R. Kelley, state health commissioner of Massachusetts.

Wednesday afternoon session, held jointly with the Section of Agriculture, brought forth a very stimulating address on "The conservation of the qualities of the rural population," by Dr. Kenyon L. Butterfield, president of the Massachusetts Agricultural College; and one on "Home economics," by Dr. C. F. Langworthy and Dr. Helen W. Atwater, of the States Relation Service, Washington, D. C. Dr. Butterfield summarized his conclusions in the statement that "education and organization should seek not alone the special group interests of farmers, but should quite as consciously endeavor to mobilize rural opinion and activities on behalf of the common needs of humanity."

The Thursday morning session was held jointly with the New England Forestry Congress and the Society of American Foresters at the State House. The papers in this session included an address on "The forests of the world," by Mr. Raphael Zon, of the U. S. Forest Service; an address on the "Economic

aspects of our timber supply," by Colonel W. B. Greeley, chief forester, U. S. Department of Agriculture; a very impressive address on "Forest research and the forestry movement," by Professor R. T. Fisher, head of the Division of Forestry, Harvard University. The session also included a brief address on "State policy in forestry," by Mr. W. A. L. Bazeley, state conservation commissioner of Massachusetts. Mr. Bazeley drew particular attention to the neglect of municipalities to practice rational methods of policy, while he said that rural towns that have the largest forest area are generally the poorest and least responsive to new ideas.

The Thursday afternoon session included five papers: "The conservation of capital," by Mr. H. T. Newcomb; "The conservation of America's economic independence," by Dr. Frederick L. Hoffman; "The element of time in industrial management," by Dr. F. S. Gilbreth; "Early and economic aspects of heart disease," by Dr. Robert H. Halsey, and "Invention conservation," by Mr. James G. Dudley. The address by Mr. Newcomb was a carefully reasoned argument, suggestive of thoughtful future consideration, including much valuable material, presented with admirable clearness. He concludes with the suggestion that "what is necessary for the conservation of capital and the maintenance of civilization is renewed confidence in fundamental principles of politics and economics, and to return to the simpler methods under which this nation obtained its principal growth, and became capable of the commanding position in the world's industry and affairs."

The Friday morning session was introduced by an address by Dr. John T. Black, now conservation commissioner of the Ætna Life Insurance Company, on "Conservation and industrial waste," followed by a paper on "The federal water power policy and its results," by Mr. O. C. Merrill, secretary of the Federal Water Power Commission. In summarizing his observations, Mr. Merrill said: "Results already accomplished afford convincing evidence that grants of special privileges are not necessary, in order to secure the development of all the electric energy that the market can absorb." He strongly opposed essential modifications of the Act of 1920 and said: "Having spent many years in developing a federal water power policy, it would be most unwise even if the act were not successful, to permit the law or the policy to be materially modified, except after fair trial and convincing evidence of the desirability of change."

General Harry Taylor, in charge of government flood control work, contributed a timely address on "Problems of flood control," summarizing the results of a wide experience applied to the solution of one of our most important present day problems. He endorsed the levee system, as having proven successful, under most trying conditions, pointing out at the present time there are nearly 1,800 miles of effective levees between Rock Island, Illinois, and the mouth of Mississippi, protecting nearly 30,000 square miles, or perhaps the most fertile area in this country. He made the concrete suggestion that in locating levees care should be exercised not to place them so near the banks of the river as to unduly crowd the stream and reduce the cross sectional area sufficiently to prevent the escape of flood waters, without causing their rise to a height that would overtop the levees. Finally, he said: "It is rarely the case that a flood control problem is not of more than local importance."

At the concluding session Friday afternoon, Dr. George F. Kunz read a most interesting address on "Our scenic resources and their practical uses," followed by a strong plea by Mr. Robert Sterling Yard on "Our national park policy in its economic aspects."

The final paper on the program was an address on "The conservation of our whale fisheries," by Dr. John Franklin Crowell, vice-president-elect of the Section of Social and Economic Sciences. Dr. Crowell raised the question as to whether whaling was a vanishing industry, discussed its world-wide extent and importance, followed by observations on changes and methods in new fields, with remarks on the principal areas of the whaling industry, and an extended discussion of the world's most prolific whaling grounds in the Antarctic Ocean.

The sessions were not as well attended as the importance of the papers would have suggested, but every effort will be made to secure for all the various papers the required and suitable publicity.

The sessions were presided over throughout by Professor Henry S. Graves, Yale University, vice-president and chairman for the section. It was tentatively agreed that next year's program should follow similar lines, but present the social and economic progress of the United States since the close of the World War.

THE METRIC ASSOCIATION

*President,* George F. Kunz.

*Secretary,* Howard Richards, 156 Fifth Avenue, New York, N. Y.

*(Report by Howard Richards)*

The annual meeting of the American Metric Association was held according to schedule in the Massachusetts Institute of Technology on December 30, 1922.

The speakers were also entirely from the industries and included such men as B. L. Newkirk, of the General Electric Company; A. E. Marsh, of the Waltham Watch Company, Theodore H. Miller, of the De Laval Separator Company, and Walter Wood, of R. C. Wood and Company, the well-known manufacturers of pipe and other steel products. The Army was represented by Major L. A. Nickerson, Ordnance Department, U. S. A., and the Navy by Captain Eliot Snow.

The practical use of the metric system, legal for all transactions since 1866, was emphasized. By motion of Dr. Arthur E. Kennelly, the Metric League, in connection with the Metric Association, was organized. There are no dues connected with this league, membership being open to all those who sign and send to the association the following statement: "It is my purpose to use metric weights and measures whenever feasible."

Owing to increase in membership both in the United States and Canada, and the undertaking of more comprehensive work, the name of the association was shortened to Metric Association.

Among the resolutions passed were those endorsing the Britten-Ladd bill, and expressing appreciation for the increased number of associations and firms cooperating in the metric movement.

The following were elected officers for 1923: *President,* George F. Kunz; *treasurer,* Frederic L. Roberts; *secretary,* Howard Richards. Communications should be addressed to Metric Association, 156 Fifth Avenue, New York.

SECTION L—HISTORICAL AND PHILOLOGICAL SCIENCES

*Chairman of the Interim Committee on the History of Science,* William A. Locy.

*Secretary of the Interim Committee,* Frederick E. Brasch, 6963 Morton Place, Rogers Park, Chicago, Ill.

*(Report by Frederick E. Brasch)*

The third meeting of those interested in the history of science movement was held in the buildings of the Massachusetts Institute of Technology, Cambridge, Mass., December 27 and 28, 1922.

This meeting was the most gratifying and successful one thus far held. It was largely due to the unusual character of the symposium held jointly with the scholars interested in the history of science within the American Historical Association.

The single session of the History of Science section was composed of a miscellaneous program. Owing to the illness of Dr. William A. Locy, chairman of the section, Dr. H. W. Tyler, of the Massachusetts Institute of Technology, presided and acted as chairman *pro tem.*

Each of the papers presented at this session carried with it, besides the interesting and strong discussion, a conviction that the history of science movement has come to be an integral part of the scientific life of to-day. There were three historical-technical papers and two general history of science papers. The two latter papers emphasized the value, methods and needs of history of science instruction in our university curriculum. Dr. George Sarton, of Harvard University, and Dr. H. W. Tyler spoke from actual experience as teachers.

The second session of the history of science meeting was the joint conference. The main concept of this symposium was the "Humanizing of knowledge"—or, better, "Humanizing Science." Dr. James H. Robinson of the Rand School of Social Science acted as chairman, and opened the meeting by calling attention to the great need of a better scientific understanding of life and its environmnt.

Besides the importance of this subject, the continuity of ideas and the coherent manner